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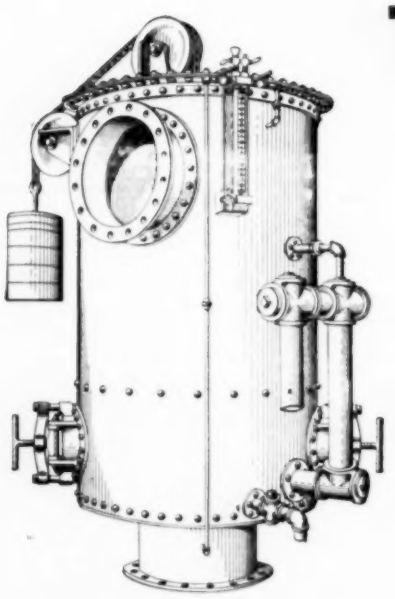
A TAR EXTRACTOR THAT EXTRACTS



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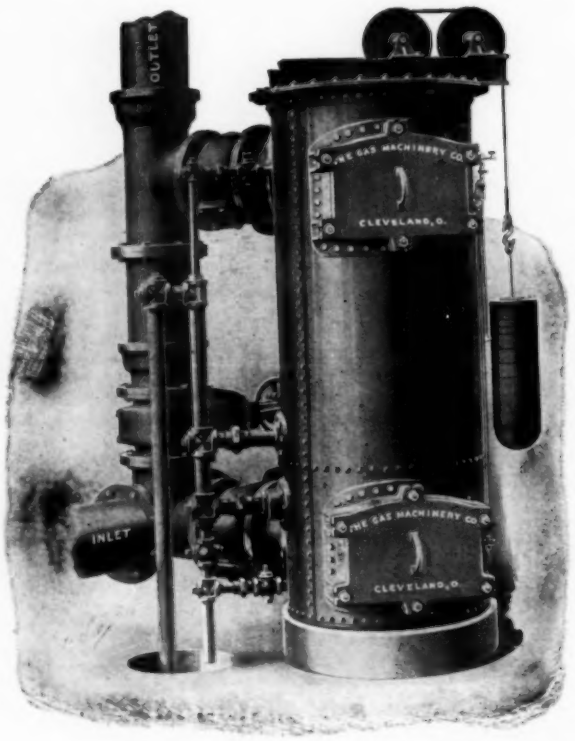

P. & A.
TAR EXTRACTORS

FOR

COAL GAS.

The Gas Machinery Company,
CLEVELAND, OHIO.

THE AMERICAN
GAS LIGHT JOURNAL

VOL. CIII., No. 19. NEW YORK, NOVEMBER 8, 1915. WHOLE No. 2,129.

SHORT CUTS IN CALCULATIONS FOR LIGHTING SYSTEMS.

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ROBERT FFRENCH PIERCE.

In perhaps 90% of the cases in which the gas or electric salesman is required to make recommendations concerning the selection and location of lamps, calculations by the "Flux Method" will suffice. In this method, a certain average intensity of illumination upon a horizontal plane (generally 30" above the floor) is the basis of calculation. It is assumed (*for purposes of calculation*) that the useful light from any unit is the light falling upon this plane, and that the outlets may be so placed as to occupy the centres of approximately square and equal areas into which the lighted area may be subdivided. In mercantile lighting, which comprises by far the greater part of the salesman's activities, these assumptions are correct within practical limits as far as *results* are concerned. The fact that they are not literally correct, however, gives the hair-splitters a peg upon which to hang their objections to this system of calculation, and it is perhaps worth while to show wherein these objections are more fallacious than the assumptions to which exceptions are taken. It is often stated that the Flux Method based upon horizontal component on a horizontal working plane entails the following erroneous assumptions:

First, that only the light reaching the horizontal working plane is useful.

Second, that the efficiency of the system so calculated is proportional to the predominance of horizontal component, and that the highest efficiency would be reached with 100% horizontal component—obviously a most undesirable condition from the standpoint of illumination.

Third, that the method does not take into account the differences between various types of distribution, placing Focusing reflectors upon the same basis as Extensive, etc. This last objection is really too trifling to receive consideration, as these differences are taken into account in the instructions for mounting heights, which are intended to be used in connection with the Flux Method.

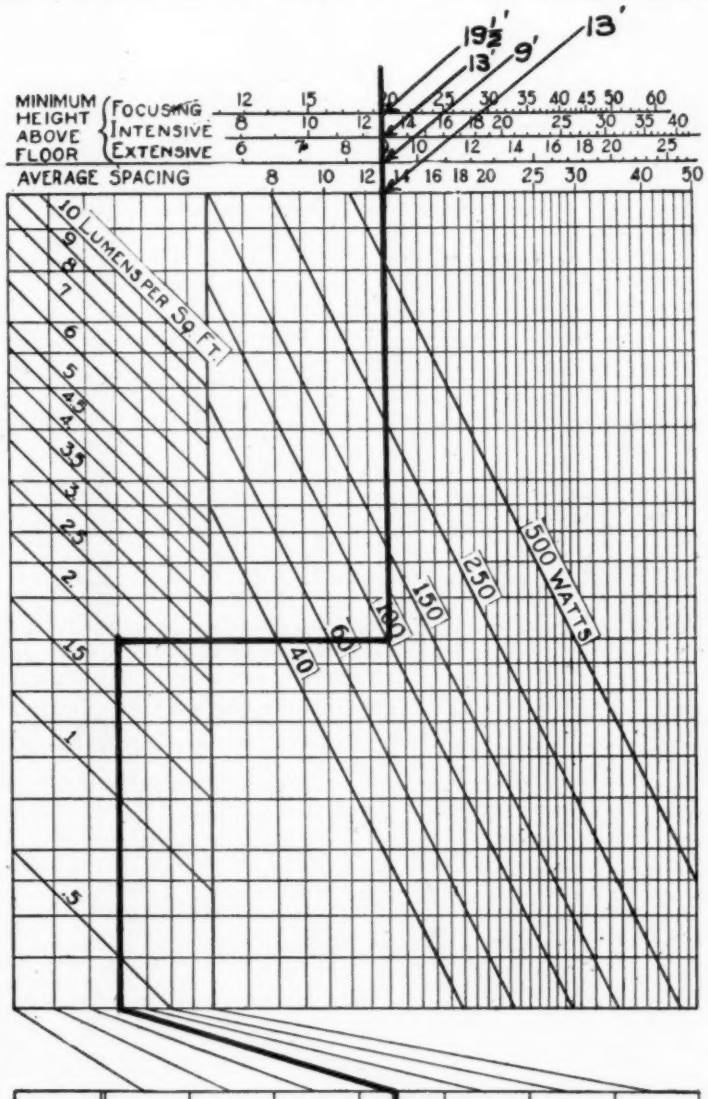


Fig. 1.

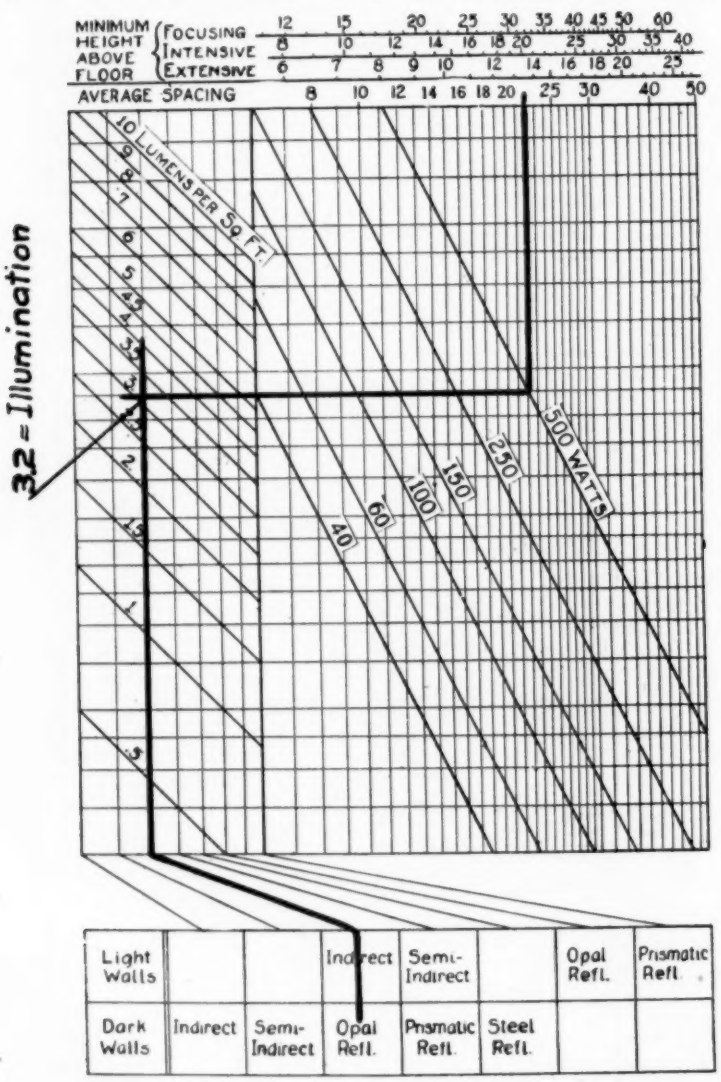
As to the first objection—that the Fluz Method based on horizontal plane illumination assumes only such illumination to be useful—it does nothing of the sort. It does assume that with any of the reflecting glassware now in commercial use, the obtaining of a sufficient illumination on the horizontal working plane will, in nearly all cases, be accompanied by *at least* sufficient illumination upon side walls and ceilings, and this is entirely true as far as the work of the average salesman is concerned. It might not be true in the illumination of art galleries, ball rooms or buildings in which decorative features are of the greatest importance, but the number of cases in which the salesman is asked to design, or suggest lighting for such purposes is so small as scarcely to warrant consideration. Neither would this assumption necessarily hold for every sort of reflector that might in the future be put on the market, but as the salesman is limited to commercial types there is no reason why methods of design intended for his use should be expected to cover every type imaginable.

The *reductio ad absurdum* involved in the second objection has no practical bearing, for the obtaining of 100% horizontal component would involve both a point source of light and a reflector-surface having pure specular reflection. The first does not and could not possibly exist, and neither are even remotely approached in any commercial type of lamp or reflector now on the market for direct lighting, or likely ever to be.

As far as the average salesman is concerned, the Flux Method, based upon horizontal plane illumination, is the only method of calculation having the simplicity required by his needs, and the comparison of units, with reference to their efficiency in producing

horizontal plane illumination, is the only really useful comparison. The accompanying charts were designed for the salesman to use in laying out lighting systems in the design of which the Flux Method, based upon horizontal plane illumination, may be used. It is assumed that the outlets may be located in the center of approximately square and equal areas, and that the mounting heights given in the table will be followed. As stated in the table, the *mounting heights* refer to direct lighting installations only. The given heights are the minima only, it being understood that the lamps may be located at any greater heights within reason, without substantial decrease in illumination. This is approximately true wherever there is more than one outlet in the room, and the greater the number of outlets the more nearly the approximation approaches the actual. It is assumed that the salesman possesses sufficient common sense not to use this method where the walls or ceilings are the principal surfaces to be illuminated, and that where steel reflectors are to be used, he will appreciate the necessity of furnishing additional illumination to eliminate the dark surroundings that accompany the use of steel reflectors hung low.

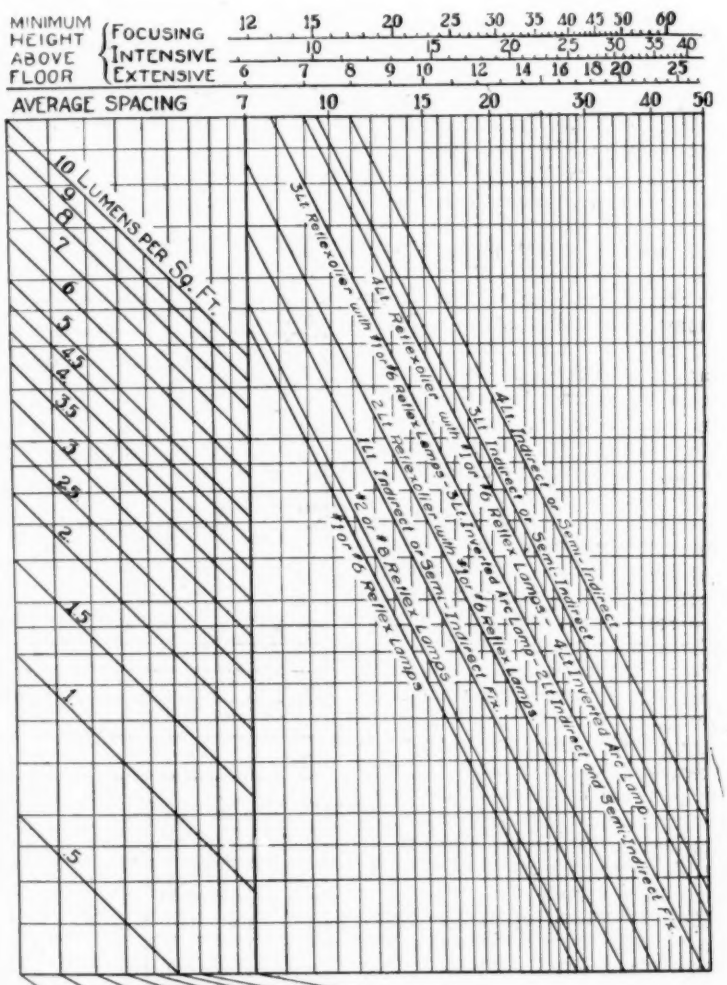
The use of the table in designing a lighting system is illustrated in Fig. 1, in which a room with dark walls is to be lighted to 2 lumens per square foot, by 100-watt tungsten lamps, equipped with prismatic reflectors. In the divisions across the bottom of the chart, designated " Dark Wall," locate " Prismatic Reflectors." From the top of the vertical column, in which this reflector is found, follow the diagonal line to the foot of the cross-lined portion of the chart, thence upward to the diagonal designated by the lumens per square foot (or foot candles) required, thence to the right to the " watts per outlet," thence upward to the average spacing and mounting heights. The former is found to be 13′ 0″ and the latter 9′ 0″, 13′ 0″ and 19½′, respectively, for extensive, intensive and focusing reflectors. It should be understood that all ball globes are considered as having extensive distribution. The spacing given, are, of course, independent of the distribution or the system of illumination used, and depend entirely upon the efficiency of utilization and the power of the unit or units placed upon each outlet.



Note – Above heights for Direct Lighting Only.

Fig. 2.

Another use of the table is in determining the illumination from at existing installation assuming, of course, all equipment to be near its initial rated efficiency. From the " average spacing " at the top of the chart proceed downward to the " watts per outlet," and locate the horizontal line upon which the intersection occurs. Now locate the type of glassware or reflector in the horizontal column at bottom of chart designated by the walls (light or dark) and proceed on the diagnol line from the top of the vertical column containing the glassware found, to the corresponding vertical line in the cross-lined portion of the chart, thence, upward until this line intersects the *horizontial* line located before. The nearest diagonal designates the lumens per square foot obtained. Fig. 2 shows the calculation for a dark walled room lighted by 1–500 watt, or clusters of 2–250, or 5–100 watt tungsten lamps equipped with opal reflectors and placed on outlets having an average spacing of 22′ 0″. The illumination is found to be 3.2 lumens per square foot.


MINIMUM HEIGHT ABOVE FLOOR
FOCUSING 12 15 20 25 30 35 40 45 50 60
INTENSIVE 10 15 20 25 30 35 40
EXTENSIVE 6 7 8 9 10 12 14 16 18 20 25
AVERAGE SPACING 7 10 15 20 30 40 50
10 LUMENS PER SQ. FT.
9
8
7
6
5
4.5
4
3.5
3
2.5
2
1.5
1
.5
4 Lt Reflexolier with 1 or 16 Reflex Lamps
2 Lt Reflexolier with 1 or 16 Reflex Lamps
1 Lt Indirect or Semi-Indirect 1 or 16 Reflex Lamps
4 Lt Indirect or Semi-Indirect
3 Lt Indirect or Semi-Indirect
2 Lt Indirect or Semi-Indirect
1 Lt Indirect or Semi-Indirect
4 Lt Inverted Arc Lamp
2 Lt Indirect and Semi-Indirect Fix
2 Lt Inverted Arc Lamp
1 or 16 Reflex Lamps
Light Walls | | | Indirect | Semi-Indirect (Upright) | | Opaline Ball Globe | Alba Refl. | Prismatic Opaline Refl.
Dark Walls | Indirect | Semi-Indirect (Upright) | Opaline Ball Globe | | Alba Refl. | | Prismatic Opaline Refl. |

Note – Above heights for Direct Lighting Only.

Fig. 3.

The chart for electric lamps has been used for illustrative purposes on account of its simplicity. The chart for gas lamps, Fig. 3, is used the same way.

The number of diagonals designating different lamp combinations could have been reduced, and a clearer arrangement obtained had it been possible to designate " cubic feet per hour per outlet." This is however, impossible by reason of the differences in efficiencies among the various types of lamps.

The salesman is frequently asked the comparative energy costs

Average Illumination in Lumens per Square Foot (or Foot-Candles) Required for Various Classes of Service.

Armory or drill hall	2.0
Art gallery (walls)	5.0
Auditorium	2.0
Automobile showroom	5.0
Ball room	2.0
Bank	3.0
Barber shop	2.5
Bath (public)	...
Dressing rooms	1.0
Swimming pool	2.0
Billiard room (general)	.8
Billiard tables	5.0
Bowling Alleys—	
On alleys	2.0
On pin-board	10.0
Carpenter shop	2.5
Courts—	
Hand ball	7.0
Squash	7.0
Tennis	7.0
Court room	2.0
Church	2.0
Depot (waiting-room)	1.5
Desk	4.0
Draughting room	8.0
Engraving	10.0
Factory—	
General illumination only, where additional special illumination of each machine or bench is provided	1.5
Local bench illumination	4.0
Complete (no local) illumination	4.0
Foundry	3.0
Garage	2.0
Gymnasium	2.5
Hospital—	
Corridors	.5
Wards (with no local illumination supplied)	1.5
Wards (with local illumination supplied)	.5
Operating table	12.0
Hotels—	
Lobby	2.0
Dining room	2.0
Writing room	2.0
Corridor	.6
Bed room	1.5
Laundry	2.0
Library—	
Stock room	1.5
Reading room (with no local illumination supplied)	3.5
Reading room (with local illumination supplied)	.7
Lodge room	2.5
Lunch room	2.0
Machine shop (general)	1.0
Market	3.0
Moving-picture theatre	1.5
Office	4.0
Opera House—(See Theatre).	
Pattern shops	3.0
Power house	2.5
Postal service	7.0
Press room	4.0
Reading (ordinary print)	2.0
Reading (fine print)	2.5
Residence—	
Porch	.2
Porch (reading light)	1.0
Hall (entrance)	.7
Reception room	1.5
Parlor	1.5
Sitting room	1.5
Library	2.0
Music room	2.0
Dining room	1.5
Pantry	2.0
Kitchen	2.0
Laundry	1.5
Hall (upstairs)	.5
Bed room	1.5
Bath room	2.0
Furnace room	.7
Store room	.7
Restaurant	2.0
Rink (skating)	2.0
Rug rack	15.0
Saloon	3.0
School—	
Classroom	2.5
Sundry room	2.5
Assembly room	2.0
Office	2.5
Cloak room	.8
Corridor	.8
Manual training	3.0
Laboratory	3.0
Drawing	5.0
Sewing (light goods)	4.0
Sewing (dark goods)	8.0
Shipping room	1.5
Show Window—	
Light goods	8.0
Medium goods	16.0
Dark goods	20.0
Sign	8.0
Stable	1.0
Stereotyping	4.0
Stock room	1.0
Store—	
Art	4.0
Baker	3.0
Book	3.5
Butcher	3.5
China	2.5
Cigar	3.0
Clothing	5.0
Cloak and suit	5.0
Confectionery	3.0
Decorator	3.0
Drug	3.0
Drygoods	4.0
Florist	3.0
Furniture	5.0
Furrier	5.0
Grocery	3.0
Haberdasher	3.5
Hardware	4.5
Hat	4.0
Jewelry	3.5
Lace	3.0
Leather	3.5
Men's furnishings	3.5
Millinery	4.0
Music	3.0
Notions	3.0
Piano	4.0
Post cards	3.0
Shoe	3.5
Stationery	3.5
Tailor	4.0
Street—	
Business (not including light from show windows and signs	.5
Residence	.1
Prominent (in residence districts)	.2
Country roads	.05
Studio	4.0
Theatre—	
Lobby	3.0
Auditorium	2.0
Train sheds	1.0
Typesetting	8.0
Warehouse	1.5
Wharf	1.0

for equal illumination with gas and electricity, and a rapid and sufficiently accurate means of calculation is useful. The chart shown in Fig IV is designed for this purpose. The gas scale of illumination is based on the use of water gas and efficient reflectors (such as Welsbach-Holophane E–1, I–1, or No 0918 Opaline, etc.), and each degree of illumination is directly above the cubic feet per square foot of floor area required to produce it in the scale below the chart. The electric scale of illumination presumes the use of similarly efficient reflectors with tungsten lamps, and each illumination is directly about the Watts per square foot of floor area required to produce it. The actual degree of illumination, or the character of side walls or ceiling or reflectors need not be considered when comparing the relative quantities and costs of gas and electricity for equal illumination in the same room, except that the distribution characteristics of each unit under consideration must be similar—that is, units having curves of same *form* and reflectors of the same efficiency must be used in the comparison. For instance, tungsten lamps in opal globes may be compared with any gas unit fitted with a globe of the same form and material.

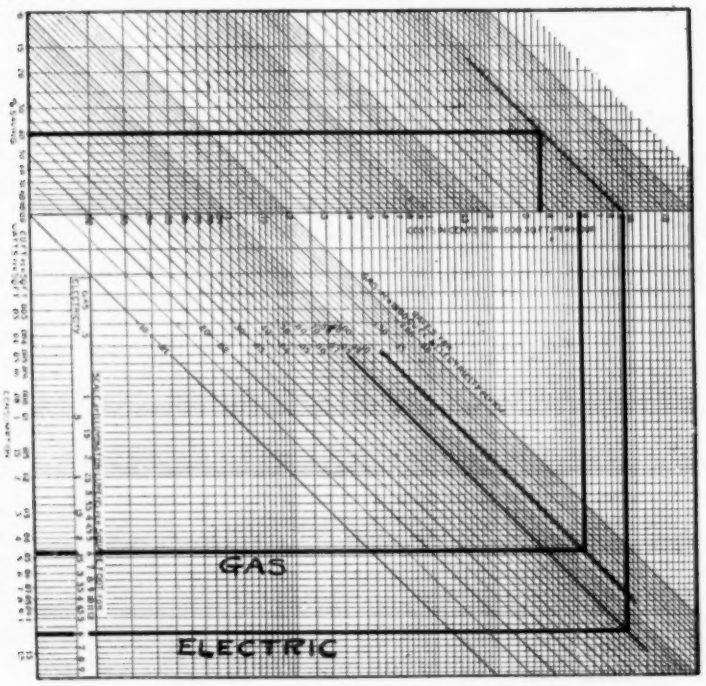


Fig. 4.

To obtain the illumination from a given consumption of gas per square foot in rooms with light walls, assuming efficient reflectors to be used:

From the "cubic foot per square foot," in the scale below the chart so designated, run upward to the scale of illumination marked "gas," and read the illumination. For electricity, use "watts per square foot" scale below the chart and scale of illumination marked "electricity."

To determine the consumption per square foot necessary to obtain any desired illumination under the above conditions reverse the process.

To obtain the cost per square foot per hour represented by any consumption per square foot: From the designated consumption run upward to the price of gas or electricity, thence to the left to the vertical scale, reading the results in the cents per 1,000 square foot per hour.

Having calculated the cost of both gas and electric illumination under any consideration, to obtain the saving in cost of one over the other, subtract the less from the greater, and from the point in the vertical scale designating the result, run to the left to the diagonal designated at its upper right-hand extremity by the greater cost, thence downward to the bottom scale, reading the per cent. saving. To obtain the per cent. increase in cost of the greater over the lesser, proceed as above, but use the diagonal designated by the *lesser* cost.

Example.—In a certain room (of any character whatever), 1.2 watts per square foot are used in tungsten lamps, current costing 7½ cents per k. w. hour. What will be the cost of equal illumination with water gas at $1.15 per 1,000 cubic feet (assuming similar glassware and lamp locations)? What will be the cubic feet per square foot required, and how much saving will be obtained?

Nine cents per hour per 1000 square foot is found to be the cost of electric lighting. The corresponding illumination (6 lumens per square foot) may or may not be the actual illumination, but calculating the same illumination for gas will introduce no error into the final result. Calculating for gas shows that for equal illumination (6 lumens per square foot on the *Gas* illumination scale) .048 cubic feet per square foot will be required, costing 5.5 cents per 1000 square feet per hour (or per square foot per 1000 hours).

Nine cents (the electric cost)minus 5.5 cents (the gas cost) gives 3.5 cents (the difference).

From 3.5 on the vertical scale run to the left to the diagonal 9, thence downward to the per cent saving = 40%.

This chart, like the preceding, is plotted to logarithmic coordinates. This method has the advantage of giving greatest accuracy where accuracy is of the most importance; that is, where the quantities involved are smallest it permits a greater range to be covered in a given space than is possible with any other system, and most arithmetical calculations may be made without the use of curved lines, making the chart very easy to plot, it being necessary to locate but one point on each line, the slope of all lines having similar functions being the same.

It must be understood, of course, that the use of mechanical or arbitrary methods does not eliminate the necessity for the use of judgment and common sense on the part of the salesman. All that is claimed for these methods is that they will result in raising the average excellence of installations made by a salesman inexperienced in designing lighting systems, far above the point they would have reached without this assistance

It is easy enough for captions critics to ferret out particular cases to which these methods cannot be satisfactorily applied. In nearly all cases, however, such instances will be found to demand a degree of special knowledge and experience that only the trained specialist can furnish. It is immeasurably better for the salesman to use with a fair degree of success methods that are in a great majority of cases productive of good results, than to attempt to use methods of greater refinement with which he cannot possibly secure even passably good results, except accidentally.

For the convenience of those who may not have such information available, a table of illumination intensities required for various purposes is appended.

The foregoing intensities represent the requirements for ample illumination. If for any reason, especially strong illumination is desired, these figures may be increased 25 to 50%, or even 100%, depending upon the customers preference.

The table is based upon the use of properly shaded lamps of comparatively low intensity. If unshaded lamps are used, from 15 to 30% more illumination will be required for equal effectiveness. Unshaded lamps should never be used where excellence of illumination is a consideration, unless hung well above the ordinary range of vision.

New Method of Coating Iron or Steel with Lead.

Coating the surface of iron or steel with lead or its alloys so that a continuous and uniform film is tenaciously applied is the subject of a recent patent (U. S. 1,144,523—June 29, 1915), granted to Jay C. Beneker, of Cincinnati, O. It covers the coating of relatively corrosive metals with a protecting film, and the patentee's efforts have been directed to finding a commercially satisfactory substitute for zinc, and one less costly than tin. He claims originality in a process based on certain metallurgical and physical discoveries. After the iron or steet surface has been cleaned of scale or oxide, it is subjected to a suitable flux, such as zinc chloride, and submerged in a bath of melted lead containing a little cadmium.

Ordinary commercial lead possesses but little affinity for iron, but in the presence of metallic cadmium, even in very small quanties, it will amalgamate with the iron surface so as to coat it with a very thin film. The inventor, under ordinary commercial conditions, preferably uses as little as 0.17%, but can use as high as 1% of cadmium. The smallest possible amount is recommended as cadmium is expensive. Since it tends to oxidize and pass into the flux, causing a loss, the addition of about ½% of zinc to the lead bath is recommended, since the zinc oxidizes first and passes into the flux in preference to the cadmium. Cadmium, being more positive than iron, its presence in the lead tends to protect the iron the same as zinc. It also is claimed to promote and subsequently maintain the adherence of the film of lead.

MANUFACTURE OF GASOLINE BY THE ACTION OF ALUMINUM CHLORIDE ON HIGH BOILING PETROLEUM.

From paper by A. M. McAfee before the American Institute of Chemical Engineers, San Francisco.

The conversion of high boiling petroleum oils into lower boiling oils of greater commercial value is an old problem, and many solutions of it have been proposed. Formerly, when kerosene was worth more than gasoline, naturally the effort was to increase the yield of kerosene from crude oil; nowadays gasoline is worth more than kerosene, and naturally the effort is to increase the yield of gasoline. But in principle, gasoline making and kerosene making from high boiling petroleum oils are the same, and most of the proposed methods make both products. With very little variation, most of them will make gas equally well. A careful examination of these methods will show, in nearly all cases, the same principle, namely, what is called cracking—heating to a sufficient temperature to cause the high boiling oils to become unstable and break down into lower boiling oils. If the heat be intense enough and the time be long enough, the product will be gas; less heat and a shorter time will make gasoline, and a still less shorter time will make kerosene.

The inventors have rung the permutations on this simple idea; they heat under pressure and they heat under vacuum; they heat in the presence of gases; they heat in the presence of catalysts; they heat in tubes and they heat in boilers, etc., etc. It is safe to say that in 99% of the methods proposed for converting high boiling oils into lower boiling oils, "cracking" by heat is involved. Sometimes it is disguised in ornate language; sometimes it lurks behind intricate apparatus, but it is always there.

The difficulty, however, with all these cracking methods is a difficulty in principle. In breaking down the complex high boiling hydrocarbons into several similar ones, there is not enough hydrogen to satuate the newly formed bodies, and unsaturated hydrocarbons must necessarily result unless hydrogen is added or carbon subtracted. Hydrogen is to expensive and difficult to add, and, though a part of the carbon is readily enough subtracted and deposited, this subtraction and deposition never goes far enough—although the still man might not be readily convinced of this. These cracked products are in large part unsaturated, and they are not desirable commercially. They are foul smelling; yellow in color and become rapidly more yellow on standing; they deposit large quantities of carbon on ignition in a gas engine; they burn with a smoky flame; they contain resinous bodies that cause gumming in use or on standing, etc. They can, of course, be refined somewhat with sulphuric acid, but there must be too much acid used, and too much of the oil lost to permit thorough treatment with acid.

Aside from the poor quality of the liquid products obtained, the operation of the cracking process is attended with great difficulty where uniform results are desired. There are many variables on which the obtaining of such results depend—temperature, time, pressure and catalytic action of the walls of the containing vessel. A change in either of these variables makes a change in the products. Using the same apparatus, the same pressure, and consuming the same time, a difference of a comparatively few degrees of temperature in cracking makes marked differences in the yield and quality of liquid products.

In most cracking processes, pressure is employed: 60 to 100 lbs. is used and some have proposed much higher. Here lies the greatest difficulty—the danger to the operators and to the plant. There is always a deposition of flinty hard coke on the inner walls of the heating element. Some who have had considerable experience in cracking oils say that the coke is forced into combination with the iron, making it brittle and unable to withstand the high temperature and pressure employed. At any rate, the deposition of the carbon occurs where the element is hottest, causing local overheating at that point. Under such conditions the tensile strength of the steel becomes an unknown quantity and as likely as not it yields to the stress without any warning. Oil vapors of a temperature around 650° F. ignite spontaneously when they evolve from a still into the atmosphere. In cracking processes the temperature is 750 to 850° F. and even higher; hence, the manifest danger of cracking petroleum oils under such pressures.

When I took up the gasoline problem, some two and one-half years ago, I dismissed from consideration the idea of cracking oils. Up to this time, or since the Friedel and Crafts British patent, No. 4769, of 1877, there have been some degree of mild interest shown regarding the effect that aluminum chloride might have on petroleum oils, but no positive results had followed. It appeared to me that this reaction might have more significance that was then apparent, and I trust that this paper may in a measure exemplify its significance.

I have found that with proper control of the vapors leaving the distilling system and entering the final condenser, and with sufficient time given the aluminum chloride, high boiling oils can be completely broken down into lower boiling oils, and no matter how unsaturated the high boiling hydrocarbons may be, the low boiling oils produced therefrom are sweet smelling, water white and saturated. The reaction gives little gas; and only about the right quantity of carbon to allow production of saturated products, not deposited as a hard baked-on carbon, but as a granular, coky mass, easily removed from the still.

But other products than gasoline can be made from petroleum, which are commercially worth while, although in our efforts to increase the supply of gasoline we have apparently forgotten this fact. If the market value of the various products that can be obtained from crude petroleum be plotted, it will be found that there is a peak at the low boiling end and another at the high boiling end. Gasoline is worth more than kerosene, and kerosene is worth more than gas oil, while the products following gas oil, paraffin and lubricating oils, are worth as much or more than the gasoline.

The problem before me, therefore, knowing the reactive power of aluminum chloride, was to apply it to crude petroleum so that good heavy oils could be obtained, while at the same time converting the less valuable portions into gasoline. The solution of this problem is found in my patent.

In the practical operation of the process, crude petroleum is first distilled until the naturally occuring gasoline and kerosene is driven off. In many of our crude oils, especially those from Texas, California and Mexico, there is substantially no gasoline and very little kerosene. But in any event, the crude is first heated to free it of any moisture, since the oil must be perfectly dry before adding the aluminum chloride.

The next step is to add anhydrous aluminum chloride to the remaining oil, and then boiling it. The boiling is usually around 500° F., and generally remains between 500 and 550° F. during the entire distillation of 24 to 48 hours. There is no need of employing extra pressure or vacuum or special apparatus: any still with a stirrer suffices.

Granted sufficient time for the aluminum chloride to get in its work, the success of the process depends upon proper control of the temperature at which the oil vapors leave the distilling system to enter the final condenser. Between the still and the final condenser are two air-cooled condensers connected in series, which separate the low boillng oils from the high boiling oils, returning the latter, together with any volatilized aluminum chloride, to the still. For a 1,000 barrel still, the air condensers that we are now using are drums of oval cross-section, 3 feet × 6 feet × 6 feet high; and a 3-foot dome, attached to the top of the still, serves to return most of the volatilized aluminum chlorides and its compounds. The operation is so controlled that the vapor is kept at the desired temperature indicated by a thermometer in the vapor line at its point of exit to the final or water-cooled condenser. This temperature should not exceed 350° F., otherwise, not only will heavy oils distil over, but the aluminum chloride (or its compounds with hydrocarbons) will enter the condenser and clog it. Under proper conditions, the distillate obtained will be a mixture of gasoline, solvent oil and kerosene, which are afterwards separated by fractional distillation. These products are all water white, sweet smelling, saturated, and need no refining with sulphuric acid. In practice, no treatment is given them, except washing with alkali, followed with water, to remove hydrogen sulphide. With proper back-trapping of high boiling oils into the still from the air cooled condensers and a temperature of 300° F. in the vapor line, the distillate obtained will be gasoline alone, ready for the market, after washing with an alkaline solution.

I have spoken of the time that should be given to accomplish the desired results. It is a mistake to assume that with a given quantity of aluminum chloride and boiling, the desired results will be obtained. I do not wish to dismiss consideration of the mechanism

of this reaction by simply saying it is catalytic. I am satisfied that it is one of association or combination in the liquid phase and dissociation in the vapor phase. It is known that aluminum chloride exists in the solid and liquid states as Al_2Cl_6, and in the vapor state as $AlCl_3$. It is also known with what avidity aluminum chloride in the solid or liquid state will combine with other salts to form double salts, the most common being that of aluminum and sodium chloride which, at one time, as you know, was the source of metallic aluminum (Castner process). Aluminum chloride probably combines with these high boiling, complex hydrocarbons in much the way it combines with sodium chloride, and when the boiling temperature is reached these double compounds become unstable and dissociate into lower boiling hydrocarbons, which, under the temperature control imposed in the vapor line, leave the distilling system as fast as produced; Al_2Cl_6 is again formed and is capable of combining further with other high boiling hydrocarbons remaining in the still, and free carbon is formed simultaneously. This view of the reaction conditions mentioned is necessary.

While the operation, using crude oil can be carried on to produce larger or smaller quantities of gasoline, in practice it is to convert the gas oil fraction into low boiling hydrocarbons, that is the paraffins and lubricating oils. Accordingly, the operation is interrupted after a portion of the crude has been converted into low boiling products, and the high boiling oil remaining in the still is pumped off hot, and on cooling, worked up into paraffin and lubricating products. The aluminum chloride remains in the still in a mass of coke, and the method of its recovery is referred to in my patents.

As illustrative of the action of aluminum chloride on high boiling petroleum oils, results with typical crudes are given in Tables I to III.

Tests on Three Crude Oils.—For sake of convenience, the distillate obtained by distilling the crude before the addition of aluminum chloride is termed " primary distillate," the oil remaining in the still being termed " primary residual oil;" the distillate obtained by distilling the primary residual oil with aluminum chloride is termed " secondary distillate " and the oil remaining in the still, " secondary residual oil." Fahrenheit temperature and Baumé gravity are used throughout. The distillation tests were made on 100-cc. samples in standard Engler flasks connected to a 22" Liebig condenser. All flasks points are in open cup tester. Viscosities noted are on the Saybolt Universal Viscosimeter at 100° F. W. W. and S. W. are abbreviations for water white and standard white, respectively.

Texas Crude Oil.—In ordinary practice no gasoline is obtained from this type of Texas crude (sp. gr. 20.8 B.). By the aluminum chloride process (see Table I), 17.75% is obtained; and this gasoline is as good as the natural gasoline from any crude petroleum. The gas naphtha, which might well be mixed with the gasoline, is increased from 0.1 to 13.03%. It will be observed that these low boiling oils have been made at the expense of the gas oil fraction and the asphaltic residual oil, the latter being broken down completely. Gas oil is the least valuable constituent of the crude. The asphaltic residual oil is used for fuel or is made into asphalt. The yield of lubricating oil by the aluminum chloride process is about the same as in the usual process, but the quality is greatly improved by virtue of the saturating effect of the aluminum chloride and the elimination of asphaltic and resinous constituents from the oil.

TABLE I.—TESTS ON TEXAS CRUDE OIL (SP. GR. 20.8° B.)

Distilled until free from moisture and until the naturally occurring gasoline and kerosene had distilled over.

Yield from Crude Oil.

	Per cent. crude oil.
Primary distillate	7.14
Primary residual oil	91.26
Loss	1.60
Total	100.00

Tests on Primary Distillate.

Sp. gr. 36° B. Bromide No. 5.46
Distillation over 260° F.

Per cent—	10	20	30	40	50	60	70	80	90	95
Up to—	320°	344°	368°	386°	400°	442°	468°	490°	505°	520° F.

Fractional Distillation.	Per cent. crude.	Sp. gr. °B.	Color.	Per cent. sulfur.	Bromine No.
Gasoline	0.303	58.0	W. W.	0.065	4.8
Gas naphtha	0.180	51.0	S. W.	0.103	3.1
W. W. kerosene	1.260	41.6	W. W.	0.071	...
S. W. kerosene	1.530	40.9	W. W.	0.133	...
Gas oil	3.791	31.2	.....	0.386	...
Loss	0.076				
Total	7.140				

Tests on Primary Residual Oil.

Sp. gr. 19.8° B. Viscosity 302
Distillation over 480° F.

Per cent	10	20	30	40	50
Up to	530°	566°	600°	656°	680° F.

Mixture of Primary Residual Oil and 7.5% by Weight of Anhydrous Aluminum Chloride Brought to Boiling.
Temperature of distillate.

Time.	Still °F.	Vapor line.	Per cent. charge.	Sp. gr. °B.
1:00 P.M.	454	268	Showed.	....
1:30 P.M.	479	290	2.86	55.9
1:45 P.M.	488	300	2.86	55.2
2:15 P.M.	495	302	2.86	54.4
2:45 P.M.	504	290	2.86	54.1
3:15 P.M.	508	290	2.86	53.5
4:15 P.M.	518	340	2.86	53.7
4:45 P.M.	523	340	2.86	53.7
6:00 P.M.	525	340	2.86	53.5
7:00 P.M.	530	344	2.86	53.3
8:30 P.M.	530	340	2.86	53.5
10:30 P.M.	542	340	2.86	53.2
1:00 A.M.	547	320	2.86	52.6
4:00 A.M.	547	300	2.86	52.4
6:30 A.M.	552	290	2.86	52.8
10:00 A.M.	551	305	2.86	50.6
1:00 P.M.	557	302	8.57	49.7
		From back trap.	1.39	

Operation stopped at end of 24 hrs.

Yield from Distillation Primary Residual Oil with $AlCl_3$.

	Per cent. charge	Per cent. crude.
Secondary distillate	52.86	48.24
Secondary residual oil	31.14	28.42
Loss (gas and coke)	16.00	14.60
Total	100.00	91.26

Tests on Secondary Distillate.

Sp. gr. 51.1° B.
Distillation over 100° F.

Per cent—	10	20	30	40	50	60	70	80	90	95
Up to—	174°	228°	265°	294°	324°	357°	388°	428°	475°	500° F.

Fractional Distillation.

Fractions.	Per cent. charge.	Per cent. crude
Gasoline	36.18	17.45
Gas naphtha	26.62	13.85
W, W. kerosene	2.65	1.28
S. W. kerosene	9.53	4.59
Gas oil	21.80	10.52
Loss	3.22	1.55
Total	100.00	48.24

Tests on Secondary Residual Oil (Freed of $AlCl_3$.)

Color.	Flash test.	Fire test.	Viscosity.
Red-green bloom	185° F	250° F.	105

Secondary Residual Oil Reduced with Steam.

Yield	Per cent. charge.	Per cent. crude.	Tests on Lubricating Oil	
Gas oil	10.00	2.84	Color	Red-green bloom
Lubricating oil	90.00	25.58	Sp. gr.	21.9
			Flash test	290°
Total	100.00	28.42	Viscosity	122

Summary.

Products from $AlCl_3$ Process (Per cent. Crude Oil.)

Distillate	Gasoline.	Gas naphtha.	Kerosene.	Gas oil.	Tubricating oil.	Total.
Primary	0.30	0.18	2.79	....	.....	82.17
Secondary	17.45	12.85	5.87	17.15	25.58	
Loss due to—						
Distilling primary distillate					1.60	17.83
Distilling with $AlCl_3$					14.60	
Redistillation of primary distillate					0.08	
Redistillation of secondary distillate					1.55	
Total						100.00

Comparison of $AlCl_3$ Process with Usual Process.

Per cent. of crude oil by	$AlCl_3$ process.	Usual process.
Gasoline	17.75	0.00
Gas naptha	13.03	0.10
Kerosenes	8.66	4.30
Gas oil	17.15	52.00
Lubricating oils	25.58	25.50
Asphaltic residual oil		12.00
Sum of products	82.17	93.90
Loss	17.83	6.10
Total	100.00	100.00

Caddo, La., Crude Oil.—This crude (sp. gr. 41° Bè.) belongs to the same type as Pennsylvania crude, paraffin-base crudes. Their products are clean smelling and require but little acid in refining. But even this type is considerably improved by the aluminum chloride process, while the yield of gasoline is greatly increased. The paraffin residual oil from Caddo crude is black and tarry, on account of the asphaltic constituents, but these are not usually present in large enough amounts to prevent the manufacture of good paraffin and paraffin lubricating oil. The distillation with aluminum chloride destroys the asphaltic constituents, giving an amber colored residual oil that may be worked into a vasaline, or into paraffin and paraffin lubricating oils. At the same time the yield of gasoline is increased from 18 to 42.32%.

TABLE II.—TESTS ON CADDO (LA.) CRUDE OIL (SP. GR. 41° B.)

Distilled to Free it from Moisture and Natural Gasoline.

Yield from Crude Oil.

Primary distillate.	Primary residual oil.	Loss	Total per cent.
26.19	71.43	2.38	100.00

Tests on Primary Distillate.

Sp. gr. 58.2° E.

Distillation over 160° F.

Per cent—	10	20	30	40	50	60	70	80	90	95
Up to—	215°	232°	247°	260°	276°	296°	315°	343°	402°	(dry point) 450° 500° F.

Fractional Distillation.	Per cent. charge.	Per cent. crude.
Gasoline	82.00	21.48
Kerosene	15.00	3.93
Loss	3.00	0.78
Total	100.00	26.19

Mixture of primary residual oil and 5% by weight of aluminum chloride was brought to boiling and distilled during 48 hours. Temperature of the vapor line was held around 350° F.

Yield from $AlCl_3$ Distillation of Primary Distillate

	Per cent. charge.	Per cent crude.
Secondary distillate	58.33	41.67
Secondary residual oil	26.20	18.71
Loss (gas and coke)	15.47	11.05
Total	100.00	71.43

Tests on Secondary Distillate.

Sp. gr. 54.0° B.

Distillation over 102° F.

Per cent—	10	20	30	50	50	60	70	80	90	95	98
Up to—	212°	260°	293°	315°	340°	365°	388°	414°	450°	480°	(dry point) 500° F.

Fractional Distillation.

Fractions.	Per cent. charge.	Per cent. crude.		
Gasoline	50.00	20.84	Sp. gr.	58.0 48.1
Solvent oil	40.00	16.67		
Gas oil	6.00	2.50		
Loss	4.00	1.66		
Total	100.00	41.67		

Tests on Secondary Residual Oil.

Color.	Sp. gr.	Flash test.	Fire test.	Pour test.
Red-green bloom	36.5° B.	260° F.	300° F.	90° F.

Secondary Residual Oil Distilled.

Yield.	Per cent. charge.	Per cent crude.
Gas oil	30.00	5.61
Paraffin residual oil	70.00	13.10
Total.	100.00	18.71

Tests on Paraffin Residual Oil.

Color.	Flash test.	Fire test.	Pour test.
Amber	375° F.	420° F	105° F.

Summary.

Products from $AlCl_3$ Process (Per Cent. Crude Oil).

Distillate	Gasoline.	Solvent oil.	Kerosene.	Gas oil.	Paraffin residual oil	Total.
Primary	21.48		3.93			84.13
Secondary	28.84	16.67		8.11	13.10	
Loss due to—						
Aluminum chloride distillation					12.71	15.87
Working distillates into standard products					3.16	
Total						100.00

Comparison of $AlCl_3$ Process with Usual Process

Per cent of crude oil.	$AlCl_3$ process.	Usual process
Gasoline	42.32	18.00
Solvent oil	16.67	12.00
Kerosene	3.93	35.00
Gas oil	8.11	21.00
Paraffin residual oil	13.10	11.00
Sum of products	84.13	97.00
Loss	15.87	3.00
Total	100.00	100.00

Oklahoma Crude Oil.—The residual oil from this crude (sp. gr. 34° Bè) by the usual process is a black, tarry mass, containing a large amount of asphaltic constituents and also paraffin. The asphaltic constituents are, as a rule, so great that it is difficult to make paraffin and paraffin lubricating oils of the same grade obtained from Pennsylvania or Caddo residuums. By the aluminum chloride process the residual oil is cleaned of its asphaltic constituents, and paraffin wax and paraffin lubricating oils of excellent quality are made therefrom. At the same time, the yield of gasoline is greatly increased, at the expense of the less valuable fractions.

TABLE III.—TESTS ON OKLAHOMA CRUDE OIL (SP. GR. 34° B.)

Distilled to Free it from Moisture and Natural Gasoline.

Yield from Crude Oil.

Primary Distillate.	Primary Residual Oil.	Loss.	Total Per cent.
20.83	78.31	0.86	100.00

Tests on Primary Distillate.

Sp. gr. 54.1° B. Color W. W.

Distillation over 152° F.

Per cent.	10	20	30	40	50	60	70	80	90	95
Up to..	210°	226°	242°	252°	271	290°	313°	345°	408	455° F.

Fractional Distallation.	Per cent. charge.	Per cent. crude.
Gasoline	70.00	14.58
Kerosene	20.00	4.17
Gas oil	7.50	1.56
Loss	2.50	0.52
Total.	100.00	20.83

(*Continued on page 298*)

THE AMERICAN GAS LIGHT JOURNAL

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NEW YORK, MONDAY, NOVEMBER 8, 1915.

The Gas Boom.

Get ready for it! The manufacturers of the country are preparing for bigger business than they have ever handled, and anything that will economize space, increase output and give uniform product is being looked for. All these mean gas fuel! Get sharply after your portion of this business.

A confidential circular from the U. S. Department of Commerce says that more than 20 nations are represented by visitors to the United States who are making their headquarters at the branch offices of the Bureau of Foreign and Domestic Commerce, and seeking new trade relations. Many of these men are members of foreign firms preparing to make purchases here. Others are representatives of big commercial houses offering unusual facilities for our manufacturers to establish agencies abroad. Their efforts to produce a greater volume of trade with their respective countries make easier the progress of American commerce in this year of opportunity.

Because of the foreign visitors flocking here, the Bureau is dealing directly with buyers as well as sellers, and bringing both classes of business men together so effectively that there are results—purchases of American goods and the making of contracts for agencies in other countries.

One example will illustrate the character of these developments. An agent from abroad who has been introduced to firms in the United States by one of the branch offices of the Bureau represents a wealthy land owner in Central America, who is interested in numerous development projects, and a large commission merchant who operates throughout Central America and down the west coast of South America. Heretofore, the latter has represented only European manufacturers, but they are shut out of the market by the war, and he has decided to push American goods. Other interests represented are located in Australia, Russia, Italy, Argentina, Spain, India, China, Canada, Japan, South Africa, Bulgaria, New Zealand, Brazil, and several other countries. Each week this fall has added to the number.

There is wide variety in the classes of goods sought, including machinery, leather, clothing, the numerous lines making up the stock of department stores, textile products of all sorts, tools, and many other manufactures. Two visitors from Russia have nearly completed the organization of a co-operative sales agency for promoting Russian interests. Their efforts were materially assisted by the Bureau of Foreign and Domestic Commerce. At one of the branch offices, a meeting to launch the project was attended by 50 manufacturers.

In all the negotiations that have been conducted, and in those now in progress, the Bureau has earnestly extended its co-operation. Its introductions, the agents report, have facilitated the transaction of business, because of the great confidence shown by business men here in the foreign representatives, so introduced.

The gas industry should be prepared to handle the demands to be thus made upon it. Get after the industrial fuel business now; you will be too busy with domestic demands next summer.

If you need new apparatus or considerable repairs, get your orders in at once. The gas construction people will be over-run a little later and you will have to wait. One manufacturer has put on 50 workmen in the last month. Be in time.

Popular Ownership.

The "Searchlight" says: "One of the best answers to the clamor for government ownership of public utilities, and at the same time one of the strongest resistences to unfair regulation lies in the growing sentiment among corporations and the people in favor of what may be called popular ownership.

"A distinguishing feature of the ownership of the Pennsylvania railway system is the large number of stockholders who live upon its lines, and in many cases are interested in the industries it serves. The popularization of stock ownership in the United States Steel Corporation by widely diffused holdings among the employees of the company has produced remarkably favorable results. In the days when the stock of the Illinois Central Railway was quite generally distributed among the farmers along its lines the political effect of that ownership was always felt. The larger the number of citizens financially interested in the reasonable success of a public service corporation, the more sentiment in the community against unfair treatment by government. It has always been true that when the people have had an opportunity to own their utilities through stock holding they have quite generally responded with purchases.

"A notable instance of this is the recent action of the Northern States Power Company, which operates public utilities in more than 40 cities and towns in Minnesota, North and South Dakota, Illinois and Wisconsin, and serves a total population of 784,000. It had on June 30, 1915, over 70,000 customers distributed through its territory. June 1st the company offered its preferred 7% stock in $100 shares at a price to yield 8%, and the response to the offer was so satisfactory that on August 15 the public was offered an opportunity of buying any number from 1 to 10 shares at $90 on payments of $5 per month. The immediate response to that offer indicated a widespread interest of the public in public utilities as investments. A large number of the purchases were for from 1 to 5 shares, many customers seeming to have decided to own enough stock so that the dividends could be relied upon to practically pay their service bills.

"Purely as a matter of public policy there can be no question of the wisdom of such a plan. Customers of a public service corporation who are owners of its stock are interested in the prosperity of the utility, as they will continue to be in good service. As user of the commodity sold by the utility, and at the same time as part owner of the utility, they are bound to be a large factor in the creation of public sentiment, that will insist upon progress in the the development of utility service and fair and reasonable treatment in government regulation.

"If the railroads would adopt the same policy and make a consistent campaign to get their stock into the hands of their shippers, it would add to the prosperity of the railways, which is always the prosperity of the nation."

Gas Meeters—New York Section, Flatbush-Nite.

On Thursday, November 18th, 1915, at 3:30 P.M., the members will assemble at the works of the Flatbush Gas Company, 273 Clarkson street, Brooklyn, to inspect the plant of the company. After the inspection the party will be conveyed by special trolley cars to Guffanti's, Coney Island, where the dinner will be served. Special entertainment is being provided. A lecture on Belgium, by a prominent lecturer, will be part of the programme. The usual admission to this lecture is $1 and $1.50. The price of the entire programme will be the usual $2. Keep this date for the Gas Meeters and arrange to be with them.

DYESTUFF SITUATION.—MUCH SMOKE BUT NO FIRE.

The Society of Chemical Industry held a Dyestuff Meeting at Rumford Hall, 50 East 41st street, New York, on the evening of October 22nd, and succeeded in arranging a program, including a large number of speakers of considerable reputation.

Prof. Chas. F. Chandler, of Columbia, well known to the gas fraternity, presided, and opened the meeting with a short history of the American dye industry.

The first speaker, Mr. E. E. Pratt, Chief of the Bureau of Foreign and Domestic Commerce, Washington, read an imposing and lengthy exposition of the subject. He gave many figures showing the magnitude of Germany's production, as well as her proponderating influence in the industry. The attempt of an American corporation, the Benzol Products Co., to do business in this country, was described, and the failure, due to German underselling, will probably be repeated when International affairs have assumed normal conditions, unless our Government takes a firm stand.

Mr. Pratt stated that the legislation against unfair competition in Canada, South Africa and Australia has proven effective.

The manufacturers' point of view was described by Mr. J. F. Schoellkopf. He stated that of the total American consumption, amounting to $15,000,000, 75% being confined to 8 colors. These colors can be produced in America at a reasonable figure, but when it comes to the hundreds of others, there is a question as to whether they can be supplied reasonably.

"Doctor" Thomas H. Norton, Commercial Agent, Bureau of Foreign and Domestic Commerce, Washington, who has succeeded in getting his name into the daily papers as frequently as a presidential candidate, called the Dyestuff situation a Dyestuff Famine, and most of his paper was given over to discussion of the measures that could be applied to promoting and furthering the manufacture of colors in this country.

Mr. Childs, President, Barrett Manufacturing Co., made a plea for a tariff commission, claiming this to be the best solution of the problem of protecting the American manufacturer.

Common Sense on the Dyestuff Question was portrayed by Mr. J. Merritt Mathews, and his description of the Dyestuff Situation was Dyestuff Dementia. He told of the many fatuous claims that have been reported in the daily press, as to new methods, etc., citing as an example how one thrifty New Englander was going to produce a red from the cranberry, and leave the fruit in a delicious and edible condition. He said that the efforts of the Government, through its publicity, had produced very misleading results, as there is a shortage that will continue until large, well equipped and well organized manufacturing concerns are prepared to enter the field on a large scale, augmented by smaller concerns to producing some of the colors in conjunction with other manufacturers.

The next speaker, Mr. John P. Wood, President of the Woolen Association, talked from the standpoint of the consumer, and his well known work before Congress in behalf of the woolen manufacturers, has led him to the conclusion that Congress can handle the tariff question successfully, and that it represents the consensus of economic thought in the country, as it exists at the time. Though desirous of promoting the Dye Industry, the fact must not be lost sight of that if a tariff wall is placed around Dyes, a similar condition must be made for commodities coming to this country carrying Dyestuffs. Otherwise the dye industry will be aided, but the American market for the dyes will be lost, as American textile manufacturers will not be able to compete with foreign textiles.

Among other speakers was H. P. Alden, of the Pacific Mills; W. H. Nichols, chemical manufacturer; E. L. Reiss, chemist, Du Pont Powder Co.; Dr. Wm. Beckers, manufacturer, and Hon. Herman A. Metz. As the speakers occupied all the time up until midnight, there was no discussion.

Utility Securities Tested.

The "United States Investor," upon investigating the conditions of Utilities in Massachusetts, speaks of them in terms applicable to these industries as a whole. It says, in part, that it is hard to find a better investment anywhere in the field of conservative investments than gas or electric companies. The earning power and stability of these companies have attracted much attention. Even during the past year, when, if ever, a general depression could be expected, the reverse was experienced by the large majority of concerns. The conservative investor sees in them safety of his principal, exemption from taxation, and reasonable rate of interest.

While the stocks of other companies were vitally affected by the war, dropping in price to the lowest levels, these stocks, although they declined, did not, even at their lowest, show a calculated yield much over 5%. The first year of the war has shown a constant increase in price of these stocks, until to-day they have nearly regained their former high prices. This is due not only to the natural growth common to these companies, but also to general improvement in efficiency of management, decreasing operating cost and increased output.

The field for the business of gas and electric companies is still large, whether or not there is an increase in population, the present field being only partially covered. To secure the legitimate business already at their hands, they are more vigorously soliciting the opportunities. Particularly fortunate are the companies of Massachusetts, in their being supervised and controlled by a commission broad-minded enough to see the investor's point of view, as well as the public's.

In a table of Massachusetts gas and electric companies it is interesting to note that only two reduced their dividends. The Springfield Gas Company reduced its dividends from 10 to 8%, supposed to be the result of issuing stock; and the Worcester Gas Company from 12 to 9%, due to a reduced price of gas to consumers.

From every point of view, as we look at utility companies, the impression is good. It is remarkable to find an industry that, in this time of war order activity, can show such improvement in business without aid from war order sources.

One important factor, common to both the gas and electric companies, is the comparitively new idea of central stations. Although not new in principle it is new from a business point of view. Whereas a few years ago the company built and equipped its plant for a more or less calculated amount of trade, they have more recently equipped their plants for future business. It is found in this way that an increase in output means practically only an increase in fuel, and that increased output decidedly decreases the cost of production. It is claimed that a plant with a capacity of 3,000,000 cubic feet, now operating on an output of, say, one-third could, on operating at its maximum capacity, lower the price of gas at least 10 cents per 1,000 cubic feet.

The advances made in business management of these companies is doing much to increase their business. We now find what were neglected opportunities being well taken care of. Both gas and electricity are being extended into districts formerly supposed to be unprofitable, but which are proving the contrary. New fixtures are being largely sold, and old as well as new houses are being equipped with modern conveniences of this nature. Special inducements are offered and the owners of property find they can have their houses equipped with both gas and electricity on terms that appeal to their sense of progress. The sales department of the companies is being developed as never before, and the improvements have been marked.

(*Continued from page 295.*)

Manufacture of Gasoline by the Action of Aluminum Chloride on High Boiling Petroleum.

Tests on Primary Residual Oil.

Color.	Sp. gr.	Flash test.	Fire test.	Pour test.
Black	29.8° Be	170° F.	205° F.	20

Distillation over 330° F.

Per cent....	10	20	30	40	43 per cent.
Up to.....	436°	484°	543°	590°	Below 600° F.

Mixture of primary residual oil and 5% by weight of aluminum chloride was distilled 48 hours. Temperature of the vapor line was held around 350° F.

Yield from AlCl3 Distillate of Primary Distillate.

	Per cent. charge.	Per cent. crude
Secondary distillate.....	64.61	50.60
Secondary residual oil.....	17.97	14.07
Loss.....	17.42	13.64
Total.....	100.00	78.31

Tests on Secondary Distallate.

Sp. gr. 48.3° Be.
Distillation over 140° F.

Per cent.										
10	20	30	40	50	60	70	80	60	95	98
Up to—										(dry point.)
225°	270°	294°	326°	358°	382°	413°	454°	503°	547°	570° F.

Fractional Distillation.

Fractsons	Per cent. charge.	Per cent. crude.	
Gasoline.....	40.00	20.24	Sp. gr..... 64.5
Kerosene.....	50.00	25.30	
Gas oil.....	7.50	3.80	
Loss..	2.50	1.26	
Total.....	100.00	50.60	

Tests on Second Residual Oil.

Color.	Sp. Gr.	Pour test.	Flash test.
Red-green bloom.....	28.2° B.	90° F.	230° F.

Secondary Residual Oil Distilled.

Yield.	Per cent. charge.	Per cent. yield.
Wax stock.....	60.00	8.44
Cylinder oil.....	40.00	5.63
Total.....	100.00	14.07

Summary.

Products from AlCl3 Process (Per Cent. Crude Oil.)

Distillate	Gasoline.	Kerolene	Gas oil	Residual oil.	Total.
Primary	14.58	4.17	....	.....	83.72
Secondary.....	20.24	25.30	5.36	14.07	
Loss due to—					
Aluminum chloride distillation.....				13.64	16.28
Working distillate into standard products.....				2.64	
Total.....					100.00

Comparison of AlCl3 Process with Usual Process.

Per cent. of crude oil.	AlCl3 process.	Usual process.
Gasoline.....	34.82	12.50
Kerosene.....	29.47	41.00
Gas oil.....	5.36	35.00
Residual oil.....	14.07	9.00
Sum of products.....	83.72	97.50
Loss	16.28	2.50
	100.00	100.00

Although the crude petroleums from various oil-producing districts differ greatly in quality and chemical composition, they are generally divided into three types: Asphaltic-base crude, paraffin-base crude, and paraffin-asphaltic-base crude. The oils I have spoken of in this paper are representative of each of these types: Texas, asphaltic-base crude; Caddo, paraffin-base crude; and Oklahoma, paraffin-asphaltic-base crude. To give figures on other crudes would be merely a repetition of the results obtained on one of these.

The Value of Mechanical or Other Indicating and Recording Appliances in the Operations of a Gas Plant.

Paper by WILFRID PHILPOT to the Canadian Gas Association.

The application of indicating and recording instruments for the purpose of determining and controlling conditions existing in the manufacture of gas, has of late years made considerable headway. Perusal of the technical press, more especially those bearing upon gas manufacture, indicates that instruments of precision are numerous, and the manufacture of such instruments has reached such a point that apparatus may be obtained for the purpose of indicating practically every physical or chemical condition met with in gas manufacture or its purification.

It will be appreciated by those in touch with the manufacture and purification of coal gas or carburetted water gas, that ways and means to enable one to exercise proper supervision and control of vacuum, pressure, temperature, quality, quantity and velocity of the product under manufacture are essential. Only by the installation of the proper appliances for the control of the various physical and chemical conditions existing can efficiency be obtained from the various apparatus that go to make up a gas plant. If, however, efficiency is disregarded, safety cannot be, and what gas manager would care to run his plant without that simple yet most important piece of apparatus, the pressure gauge?

The value of the water pressure gauge, as applied to the operations conducted on a gas plant, is so well known to most of you that to dilate upon its varied and extensive uses would be wasting valuable time. Suffice to say that a liberal supply of such gauges, especially those of the recording type, is the only means of insuring safe working. To the one who properly interprets conditions indicated and recorded, such apparatus represents also a saving of time and labor. The fact that in all modern gas works, recording gauges are found on the inlet and outlet of each piece of apparatus is sufficient evidence of their value. What has been said with reference to pressure gauges may be applied to those of the vacuum type. A recording vacuum gauge in the retort house will greatly help in the maintenance of a steady seal, and incidentally a uniform quality of gas.

The value of pressure and vacuum gauges around a gas plant is only equaled by the benefit derived from the free application of the thermometer. Thermometers should be as numerous as pressure gauges, for, as is well known, the efficiency of each apparatus, the yield of by-products, as well as the quality and quantity of the finished gas are so vitally dependent upon the various temperatures carried during the process of purification that the free application of indicating and recording thermometers cannot be disputed. Ignorance of temperature conditions will result in two things—gas improperly cooled or gas over-heated, both conditions are undesirable.

A thermometer on the inlet and outlet of each piece of apparatus, from retort house to governor house, will help in securing proper and efficient working of the apparatus, each piece of apparatus being made to fulfil its designed purpose without overlapping. Condensers will condense, washers will wash, and purifiers cleanse the gas, each doing its work with maximum efficiency. Purifiers without proper temperature control are made to do work that should have been accomplished earlier in the purification process. Over-cooling or too rapidly cooling of the gas may be eliminated by the proper application of the thermometer, resulting in increased efficiency in the working of the plant and a higher quality of gas and by-products. The pressure gauge and thermometer are usually found in all gas plants, and represent types of instruments admittedly necessary to ensure safe and efficient management in the manufacture of both coal gas and carburetted water gas.

Present day methods of using gas have brought about conditions whereby the heating value or thermal efficiency, as well as the density of the gas, are of prime importance. This leads one to mention other types of indicating and recording instruments, not usually found on all gas plants and representing apparatus not long since introduced into gas works. I refer to tho indicating and recording calorimeters, and indicating and recording gravitometers. These instruments, although not so essential to insure satisfactory running, are very valuable, for by their proper application one is enabled to secure information whereby the variations in the quality of the finished product may be kept within narrow limits. The importance of maintaining a gas of regular density, as well as of uniform heating value, cannot be too strongly urged; for unvarying density and heating value would facilitate that much desired condition of proper air regulation, so necessary to insure efficiency in

gas consuming appliances. It is likely that more trouble than one would care to acknowledge, could be traced not to "bad gas," but to unsteady quality.

The "total heat" calorimeter, an instrument for measuring the whole heating value of a gas, stands in the front rank of indicating calorimeters. This instrument, with an indicating gravitometer, is most valuable in facilitating the governing of the finished product. These two instruments give the results at a glance; the former the heating value in either gross or net B. T. U., the latter the specific gravity. From the specific gravity recorder a clue to the composition of the gas may be obtained, and causes of variation in heating value diagnosed. The relationship of density and heating value may be summarized as follows:

High density and high heating valve, signifies rich gas.

High density and low heating value, signifies low grade gas, due to air or furnace gases.

Low density and low heating value, signifies lean gas high in hydrogen, corresponding to a large yield per ton.

By absorbing the carbon dioxide periodically, and passing the gas free from CO_2 through the gravitometer, the cause of high density and low quality may be determined, for if it is found that a lower density is shown after absorbing the CO_2 it may be inferred that furnace gases are present; but if only a slight change in density is noted, you may be assured that the low quality is due to admission of air. It follows then, that in endeavoring to maintain a quality within reasonable limits, say 2 to 4%, the above instruments used conjointly are a valuable acquisition. If desirable the candle power may be determined in lieu of heating value, in which case a jet photometer graduated in B. T. U. and candles will answer the purpose. Recording calorimeters and gravitometers may be used to great advantage in controlling quality, both in the manufacture of coal gas and carburetted water gas.

The closer any quality indicating machine is placed to the point of generation, the quicker variations may be noted and rectified. Consequently, by placing the apparatus as near as possible to the retort house, or as close as convenient to the outlet of the washbox of the water gas plant, irregularity may be corrected instantly and gas of an even quality manufactured, day and night. Of course, it would be necessary to pass the crude gas through a small condenser and purifier previous to its passage through the testing apparatus.

Temperature control in the manufacture of water gas, by means of indicating and recording pyrometers, is the usual practice in all modern installations. The importance of determining the temperature of carburetter and superheater is well known. Elimination of troublesome lamp black and napthalene, high B. T. U. value with a minimum of oil, are some of the advantages accruing from the proper use of pyrometers. Indicating and recording steam meters also assist in obtaining maximum make of gas and maximum quality, as well as giving information relative to the condition of the fuel bed. Carbon dioxide recorders, giving a continuous recorder of the percentage of CO_2 in blue or finished water gas, provide another means of scientifically controlling the operations of the machines.

It is only through the use of the various instruments mentioned that it is possible to give to gas the refinements essential to insure regular delivery to the consumer of a gas of uniform quality at minimum cost of production.

Sulphuric Acid in Great Britain.

The scarcity and high price of sulphuric acid in Great Britain (in the late spring a contract was closed at $20 a ton delivered) are responsible for the fact that some ammonia producers are considering the advisability of dropping sulphate manufacture for the time being, and putting in its place plants for making strong ammonia or concentrated gas liquor. At first sight this latter proposition appears to have many advantages, since, calculating on ammonia values, and on present prices of acid, labor, etc., it can easily be shown that the manufacture of strong ammonia is more profitable. There are, however, some objections to it, and the most important that the demand is limited. Strong ammonia is used principally for certain trade purposes; and if the supply is increased to any extent, the price will certainly fall, and then the profit is such that sulphate making will pay better. Then, too, the trade in strong ammonia is entirely in the hands of one or two large firms, who, if necessary, could easily squeeze out a smaller and less powerful competitor.

Office and Store Lighting by Gas.

From the paper by THOMAS SCOFIELD and O. H. FOGG to the International Gas Congress.

Modern Gas Units.—Great advances have recently been made in the development of incandescent gas lighting. Until the last few years, there were but few sizes of incandescent lighting units on the market, but now we find a complete equipment of types and sizes of inverted and upright incandescent gas burners at the disposal of the engineer.

Modern Gas Fixtures.—Coincident with these developments in burners came a marked improvement in fixture design. Far removed from the old conception of "gas fixture," as all that is ugly and inartistic, is the modern gas fixture. Designs of gas fixtures are now all that could be desired. Illustrations show the gas fixtures, for semi-indirect and direct lighting, that are adaptable for store and office lighting.

Requirements for this Class of Lighting.—In office lighting, "lighting" means correct lighting in a commercial sense, for which it has to be designed with regard to efficiency, quality of light, economy, dependability and appearance. Modern gas lighting gives correct lighting, as the actual installations illustrated have conclusively proven.

Store lighting has the same general requirements as office lighting. More consideration has to be given to appearance than in office lighting; the quality and color of the light, as a medium for the display of goods, is more important and the dependability more necessary.

In addition to the elements of efficiency, quality and color of light, dependability of service and appearance, which are advantages of gas lighting particularly applicable to store and office lighting, there are many more advantages which this illuminant possesses that apply to all classes of lighting. Some of these are: its acknowledged hygienic value, purifying the air; the fact that in radiant energy given off, candle-power for candle-power, it does not differ from electricity; the recently proven fact that it does not reduce the oxygen content of space illuminated; its flexibility, and the means of distant control and ignition now available.

OFFICE LIGHTING.

The following classifications are those into which office lighting naturally divides itself, say, in a large office building:

General office lighting—Large office spaces for general clerical work.

Private office lighting—Small offices occupied by one, two or three persons, board-rooms, etc.

Drafting room lighting.

Hall and corridor lighting.

General Office Lighting.—The illumination to be provided in this class is for clerical work over a large area—and general illumination is the modern solution.

The requirements are rather exacting. The intensity of illumination has been found to vary through a wide range, and also in respect to the system of lighting chosen. With the semi-indirect system, a slightly higher intensity is necessary. Generally, the range of 3 to $5\frac{1}{2}$ foot candles will cover any case in this class. Shadows have to be eliminated, and the illumination must be uniform and well diffused—qualifications obtained by the correct spacing of the indirect or direct lighting units—much more effectively, however, with the semi-indirect units.

Specular reflection and glare are to be avoided. These are less liable to be produced with the incandescent mantle than with the modern electric incandescent unit. This is due to the low intrinsic brightness of the incandescent mantle, as compared with the incandescent electric unit—the ratio being 1 to 30.

The quality of the light is important, as concentration on fine work is often required. Gas is the least fatiguing illuminant to work under, and besides has great daylight qualities.

Illustrations are given showing clearly the use of gas for this class of office lighting; they are typical of the best modern practice, and illustrate the modern treatment of large general office spaces, with both the semi-indirect and direct lighting systems.

Private Office Lighting.—This class of lighting generally means the illumination of a comparitively small area occupied by a single person, although the same space may have two or three occupants and still be in the same class. It proves more exacting in its requirements than lighting a general office space, due to the personal preference of the occupant and other considerations. The intensity required is from $2\frac{1}{2}$ to 4 foot candles.

The general requirements are the same as for general office lighting. There are many reasons why wider variations occur in this form of lighting, besides those due to the personal equation of the occupant. A private office may be occupied by one person having one or two desks and nothing else requiring a working intensity of illumination. The same size space may, in addition, contain filing cabinets, safes, maps, etc., along the walls, making a different lighting treatment necessary. If two or three persons occupy the same space, it will again change the layout of outlets, fixtures, etc.

Semi-indirect lighting, with its remarkable diffusion and softness, absence of glare and decorative possibilities, is most satisfactory—although direct lighting, when correctly installed, is suitable and, in many cases, obligatory.

Illustrations show clearly how successfully the modern gas lighting equipment and accessories are meeting this wide range of requirements. These illustrations cover the divisions of private office lighting, as previously pointed out, and show semi-indirect lighting with both local control and pilot ignition, and magnetic control from the wall switch; direct lighting, made necessary by local conditions, and semi-indirect lighting obtained from a multi-light direct lighting fixture, with bowl shaped shades and small upright units.

Drafting Room Lighting.—This lighting is essentially the illumination of large areas similar to general office lighting, but it has a few requirements peculiar to itself. The intensity must be high, the diffusion perfect and the distribution uniform. With the high intensities required, the absence of glare and specular reflection is very important. The quality of light is of extreme importance, in order to prevent eye strain. Modern incandescent gas lighting meets these requirements, especially with the semi-indirect system. The intensity in this class of work is found to vary between 7 and 10 foot candles.

Hall and Corridor Lighting.—The gas lighting of halls and corridors of office buildings presents few difficulties for solution. There are two divisions of this class of lighting: First, lighting the ordinary office building hall; second, lighting the main corridor containing special decorative features.

In the first case, direct and semi-indirect lighting, properly designed, is entirely satisfactory. In the second case, the lighting units should be designed to form part of the decorative scheme. Intensities required vary from 5 to 2-foot candles.

The characteristic of gas lighting, which makes it especially suitable for this work, is its close approach to daylight color value, since it has to be used to augment daylight, and, therefore, it gives the best possible effect.

Store Lighting.

For our purpose it had been deemed best to make three general sub-divisions of store lighting; each one is treated in a broad way, and a few typical illustrations given of gas lighting for each class.

The following classification is used:

(1) Lighting of small stores.
(2) Lighting of medium sized stores.
(3) Lighting of large stores.

Small Stores.—In this class will come such stores as art, book, cigar, music, notion, post-card, stationery and delicatessen stores, barber shops, bakeries, haberdashers, tailor shops, etc,

This type of store is generally owned by persons of limited means, who require an economical lighting installation. On this point alone, gas has a great advantage over any illuminant. Besides it has several other advantages, inherent in all forms of modern gas lighting, and for these reasons we find large numbers of small stores gas lighted, since gas can best meet the requirements of a simple, moderate priced installation.

Each kind of store will have definite requirements peculiar to itself. Since this is true, and since local conditions play an important part, only the broadest statements can be made. The intensity of illumination required can be said to vary from 2 to 4-foot candles. Usually the space to be illuminated is long and narrow, making one central line of lighting units most desirable. The direct or semi-indirect systems can be used, but direct lighting is in greater favor for this class of work.

Medium Size Stores.—Under this classification will be found such stores as butcher, china, cloak and suit, confectionery, drug, grocery, hardware, hat, leather, piano, shoes, florists, millinery, etc.

As these stores are generally owned by persons better equipped financially, than in the case of small stores, more thought can be given to the advertising and decorative value of the lighting installation. The lighting installation can here be treated as a part of the store furnishings. The interior of the store must be made attractive, not only to those who have already entered, but to those glancing in from the exterior.

Gas lighting with modern units suits the conditions so well that we find an ever increasing number of establishments of this class becoming users of this means of illumination. Due to the artistic and attractive appearance of the gas semi-indirect units, now on the market, this type of lighting is becoming very popular. It has proven to meet the requirements of medium size store lighting with entire satisfaction. Purely local conditions govern the intensity of illumination required, and a range of 2½ to 6-foot candles can be said to generally govern this class of work.

Large Stores.—Large stores will comprise such establishments as clothing, dry goods, furniture, furrier, jewelers, department stores, etc.

This class requires the most careful consideration of the advertising and decorative features of the lighting installation. Gas has successfully met these exacting demands, in most cases with the semi-indirect unit; but in some cases, due to local conditions, it has been desirable to use the modern direct lighting gas unit. One great advantage that gas possesses is its absolute reliability, giving no possibility of sudden failure of the lighting service on a busy evening. This has been realized, and with the other advantages of gas lighting, has gained many installations in large stores. The intensity varies, but a general range is from 3 to 7-foot candles.

Window Lighting.

Directly connected with the interior lighting of stores is the subject of show window illumination. This class of lighting has peculiar requirements. The primary object is to make the display of merchandise the prominent feature; again, the means of lighting must be concealed from view, and the goods must be lighted from the proper direction.

The intensity of illumination varies through quite a wide range. Since window lighting is purely an advertising feature, the intensities required can be said to fall within the range of 10 to 30-foot candles—local condition and the coloring of the goods displayed influencing the intensity to be used.

The daylight value of gas is especially advantageous for show window lighting, where the goods on display are best shown in their true daylight color values. With gas lighting for show windows, any of the forms of control or ignition can be used, as well as several forms of automatic regulators, that can be set to turn the window lighting off at any prescribed time. Convenience and flexibility of the gas units, with the advantage of color value, have made them especially desirable for this work.

The two forms of installation now in general use are: First, the separate inverted gas units placed at the front and top of window, equipped with angler reflectors and hidden from the front by opaque material, such as a curtain; and second, placing the units with conical reflectors over a transparent deck or false ceiling having translucent glass panels. In both cases the units should also be concealed from view, when viewed from within the store.

Conclusions.

The authors have endeavored to discuss, in brief, the many different phases of office and store lighting in general. It has been attempted to show how modern gas lighting can meet these requirements. A few illustrations have been presented to show how successfully modern gas lighting is accomplishing these very things.

Recent Patent Issues.

Prepared for the American Gas Light Journal by Royal E. Burnham, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,153,506. Gas Producer. O. D. Lucas, Westminster, London, England.

1,152,623. Gas Producer. E. A. W. Jefferies, Worcester, Mass., assignor to Morgan Construction Co., same place.

1,153,631. Water or Gas Box. E. S. Landis, Reading, Pa.

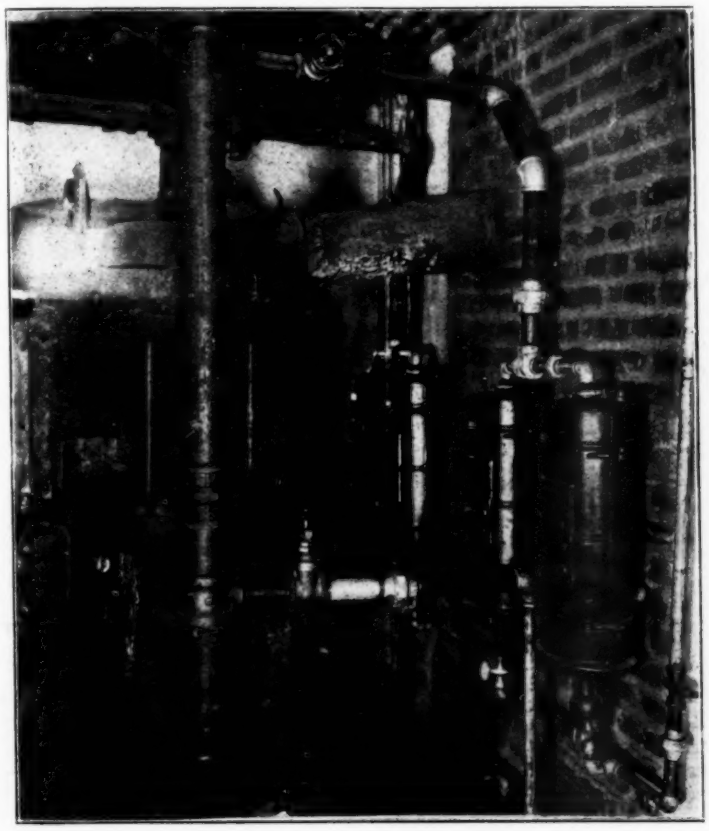
1,153,643. Automatically Adjustable Mixer for Gas Burner Valves. A. J. Reedy, Battle Creek, Mich., assignor to A-B Stove Co., same place.

1,153,766. Apparatus for Mixing Gases. Gustaf Dalen, Stockholm, Sweden, assignor to Svenska Aktiebolaget Gasaccumulator, same place.

House Heating with Gas.

LOUIS J. PRIETH.

The successful installation of gas for house heating has been made in the home of Mr. Harry E. Stahl, 275 Bellevue avenue, Trenton, N. J. It is an 11 room house with cubical contents of 14,850 feet, and is equipped with 632 square feet of radiation for hot water service. The boiler is insufficient to handle the load during extreme cold weather, and also found to be very expensive to operate in the spring and fall. The piping is so arranged that



Gas as an Auxilliary and as a Booster for House Heating.

the house is divided into two sections, and on each section two No. 50 Climax Water Heaters have been installed. The building will have to be used for at least a season before results, as to the expense, will be obtainable, but one feature has given much pleasure to the tenant, and that is that he can obtain heat from his radiators 15 minutes after lighting the gas in the water heaters. We feel that with this as a foothold, more business of this character will be obtained.

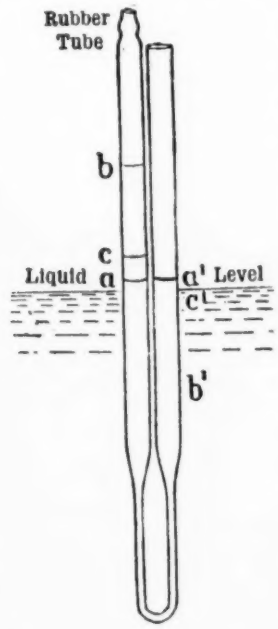
Great Lignite Resources of North Dakota.

Lignite underlies almost all the western part of North Dakota. It is estimated by the United States Geological Survey that the State contains the enormous amount of 697,000,000,000 tons of lignite in beds over 3 feet thick and within 1,000 feet of the surface, and it seems probable that there is workable lignite within this limit under every section of land in the western part of the State. It is difficult to form an idea of a mass containing even 1,000,000 tons, and hence the figures given are practically impossible of comprehension, but if the amount is put in the form of a cube a better conception of its magnitude may be obtained. The lignite of the State, formed into one mass would make a cube 5 miles long, 5 miles broad, and 5 miles high. Such a cube would cover nearly a township of land, and be almost as high as the highest mountain on the globe.

While much of the lignite is of poor quality and at present used only in a small way, it constitutes a vast fuel resource that will in time be of great value, not only to the citizens of the State but to corporations that seek power for manufacturing or transportation purposes.

New Methods and Appliances.

A COMPARISON VISCOMETER FOR OILS.—In the "Journal of the Society of Chemical Industry," London, is a description of a viscometer designed by Mr. Alan Speed, in which the designating marks are above the surface of the heating liquid, which need not, therefore, be transparent, as is necessary with viscometers wholly immersed is a heating liquid. The instrument consists of a glass tube drawn out to a capillary and bent into U-shape. The oil to be used is filtered into the viscometer, which is clamped vertically in the bath so that the level marks, a a^1, are just above the surface of the heating liquid. The bath is kept at the required temperature, and after a few minutes the levels, a a^1, are carefully adjusted by taking out or adding oil. The liquid is then sucked up the left limb of the tube, by means of a piece of rubber tubing, until it passes the level, b; and is then allowed to descend. The time taken to fall from b to c is noted by a stop watch, and the experiment repeated as a check. Part of the liquid under observation is above the surface of the heating liquid and is therefore at a slightly lower temperature, but only the viscosity of the liquid in the capillary tube counts. The thinness of the wall of the capillary ensures that the liquid passing is at the temperature of the bath, and the column of liquid, bc, never reaches the capillary. The time of flow is taken from b to c, because on approaching a the motion becomes very slow because of the slight head. The best results are obtained with a capillary size giving a time of flow from 1 to 2 minutes.



RELATION OF THE HORSE POWER AND KILOWATT.—[From Circular No. 34, 3d Edition, Bureau of Standards.] It is considered desirable that the watt and kilowatt be used as the unit of power, whenever possible, for all kinds of scientific and engineering work. It is not unlikely that the unit horse power will ultimately go out of use. In the meantime, it is desirable that its definition be uniform. This circular has been written to point out that if the horse power is to represent *the same amount of power of different places* its relation to the watt must be a constant number, and the number of local foot-pounds or kilogram-meters per second it represents must vary from place to place. Table given shows clearly this variation with locality. (This variation is 0.6%.)

It is recommended that engineering societies and other interests concerned recognize the value of the English and American horse power as 746 watts (or 550 foot-pounds per second at 50° latitude and sea level, approximately the latitude of London), employing Table to obtain the value in foot-pounds per second at other places. It is also recommends that the value of the continental horse power be taken uniformly as 736 watts (or 75 kilogram-meters per second at latitude 52° 30′, the latitude of Berlin), and that the value in kilogram-meters per second at other places be obtained from such a table as Table 5.

The value, 746 watts, is used by the Bureau of Standards as the exact equivalent of the English and American horse power.

CONDENSER COOLING WATER PER POUND STEAM CONDENSER.—In a discussion on steam-turbine operation at the Philadelphia section of the American Society of Mechanical Engineers, Mr. J. S. Barstow explained that good turbine operation at a 28″ vacuum and a temperature rise of the cooling water to within 10° F. of that due to the vacuum, calls for the circulation of 52 units by weight of cooling water for each unit of steam condensed. For a steam engine operating at a 26″ vacuum, there will be needed 25 to 27 units of cooling water for each unit of steam condensed. When the water returned to the condenser is 90° F. to produce a 27″ vacuum for a turbine, the pump must circulate 70 lb. of cooling water per pound of steam condensed; as against 30 lb. required to produce a 25″ vacuum for the reciprocating steam engine. These considerations demand attention when selecting a steam prime mover where artificial cooling of condenser water and recirculation is required.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Easton (Pa.) Gas Works, one of the properties controlled by W. S. Barstow & Company, New York, has closed a contract with the Canister Company, of Philadelphia, for a minimum of 20,000,000 cubic feet of gas per year for 5 years. Considering the development of the Canister Company in the past, the actual consumption during the contract period will probably be greatly in excess of 100,000,000 cubic feet. This is an example of what may be done in industrial gas by energetic solicitation, backed by good service. It is regarded as one of the biggest industrial contracts of the year and will probably lead to other good contracts in the Easton territory. The Canister Company manufactures containers for various trade purposes, much of its work consisting of stamping and forming sheet metal, and most of the sheets are heated as they are being formed. The product also goes through lacquering, tempering and soldering processes, all requiring an easily regulated heat. Oil furnaces were used for a number of years, but about two years ago they were induced to adopt gas, the results were so satisfactory that, as soon as the necessary equipment is installed, all the work will be done with gas. The maximum consumption of gas, at first, was 25,000 feet, but this increased during the past year to 125,000 feet monthly. It was when the growth of the Canister Company's business required the enlargement of the plant that it was decided to put gas heating equipment throughout. The fact the utility company was willing to co-operate to make the use of gas a success was a large factor in determining the change.

MR. R. N. BUEL, of New Britain, Conn., sends us a copy of the "Daily Mirror," the first page of which shows by photographs how an English woman and her young daughter run the gas works at Chew Magna, a Somersetshire village, near Bristol. The illustrations show them drawing the fires from a bench of retorts, closing retort mouthpieces, raising the purifier cover, and reading the station meter. The description says: "Women since the war have invaded man's sphere to an extent hitherto unknown, but few of the gentler sex have undertaken more strenous duties than Mrs. Summers and her daughter, who, under the supervision of a manager, are making the gas for Chew Magna, a Somersetshire village, near Bristol. They handle the shovel with all the skill and just as much zest as many a male, and the village is very proud of the excellant quality of gas supplied."

IT is announced that the Western States Coke Company has decided to locate its plant in Minneapolis, at 33d avenue n. e. and the river. It was generally understood that St. Paul was working to secure its location there. The directors of the coke company are Clark Hempstead, W. A. Koon and Burton E. Hughes, Minneapolis; George H. Prince, St. Paul; Edward G. Wilmer, William Bannen and H. H. Springford, Milwaukee.

IT is not often that a gas plant manager has to throw up his hands, but the Mapleton, Ia., paper says that the local gas plant has been shut down for a week for repairs to the steam boiler, the tubing of which was burned out after five years of continuous service. It resumed operation Saturday evening about supper time. Many of the storekeepers and the housewives who cook with gas were happy that the various makeshifts that had been used for the past week could be done away with. The men of the Sioux City crew, who have worked night and day for the past week making the repairs, left Saturday morning for their homes.

C. E. GRAY, JR., formerly superintendent of the gas department of the Eastern Wisconsin Railway and Light Company, Fond du Lac, Wis., has succeeded C. M. Eyman as manager of the Boise Gas Light and Coke Company, Boise, Idaho. Mr. Eyman becomes assistant manager of the Utah Gas and Coke Company, Salt Lake City, Utah.

F. R. HUTCHINSON, special agent of the East Ohio Gas Company, read a paper on "Gas House Heating" before the Cleveland Engineering Society, in the Chamber of Commerce Building. The talk was especially for women guests; and light refreshments were served.

ESCONDIDO, CAL., will vote on Nov. 15th for or against the acquisition of an electric light and gas plant. The proposition is to issue $50,000 worth of bonds for the electric light and gas utilities. The bonds are to bear interest at the rate of 5½%. It will be opposed by stockholders of the Mutual Water Company, who are interested in a movement on the part of the subsidiary lighting and power plant of the water company for the delivery of the light and power within the city limits. Advocates of municipal ownership, pointing to the installation of the municipal water plant, will meet their opponents with a solid front, and an interesting campaign is expected. The city trustees have asked the State Railroad Commission to fix the value of the existing electric light and gas plant of the Escondido Utilities Company.

THE Bradford (Pa.) Gas Company has made application to the Public Service Commission of the commonwealth of Pennsylvania for permission to enlarge the territory supplied by the company to include the villages of Burtville and Roulette in Potter county, and the boroughs of Eldred and Port Allegany and the village of Turtle Point in McKean county.

THE financial difficulties of the Auburn (Wash.) Gas Company have been adjusted, L. C. Smith being made receiver, and the Citizens State Bank advancing money to pay the claims of the employees of the company, who asked for a receiver. The bank will operate the plant until a readjustment of the organization can be effected, and Auburn people will continue to have gas service. The troubles arose through failure to get money from the sale of bonds. When the Gas Service Corporation was organized, a surety company took over the bonds and was to advance money to develof plants at Auburn, Bremerton and Montesano. Four months ago a disagreement arose between the bonding company and the gas corporation, and the supply of funds was shut off. For four months the employees of the Auburn plant received no wages. To continue the operation of the plant, the Citizens State Bank has advanced the $1,800 necessary to take care of the claims of the employees. Great credit is due the employees of the company for their loyalty to the enterpaise. Though they received no pay for the four months, they stood together and rendered first class service.

THE employees' social club of the Fitchburg (Mass.) Gas and Electric Light Company opened their season at the club rooms near the plant of the company, when officials of the Tenney syndicate were guests of the occasion, and an interesting program was presented. The club rooms were decorated for the occasion, and there was music with other entertainment features. President A. B. Tenney, vice-presidents D. E. Manson and H. T. Sands, and other representatives of the Tenney syndicate, were among the special guests of the occasion.

JUST what degree of responsibility a company selling gas assumes in case of leakage of gas from the pipes of the company will be tested in the case of Henry Selleck against the Danbury and Bethel (Conn.) Gas and Electric Light Company. The plaintiff is suing for damages because of illness suffered, which he claims was caused by the leakage of gas from the pipes of the company near his home. Both plaintiff and defendants make some interesting points in their pleadings in the case, and the trial of the suit promises to be interesting. It is said that no case exactly similar has ever been tried in the courts of the State. Judge Williams, in the superior court, has granted the motions of counsel for defendants to strike out certain points in the complaint. One was the claim that the defendants agreed to furnish gas without a leakage. The Judge found that the company does not make any such agreement. The motions to "strike out" were in the nature of a preliminary skirmish of counsel in getting the pleadings in shape.

FOR 18 months an ordinance permitting the United Gas Improvement Company to substitute gas as the illuminant on approximately 19,000 street lamps now furnished with gasoline lamps, has been before the Philadelphia City Council. The purpose is to better the lighting of the city and to cut the lighting bill by $70,000 a year, besides placing on the capital account of the city more than $400,000 in real property, all without expense to the municipality. The United Gas Improvement Company declares it is ready to commence operations as soon as Councils act.

SIGNED by John W. Ellis, as President and Manager, the Providence (R. I.) Gas Company has issued a communication to its cus-

tomers to let them know that the company's new slogan, "At your Service," is not a misnomer, but that the company is at all times ready to cater to the wants and wills of the customers. "The best results can be obtained only by your co-operation," the circular says, and the company requests that any trouble experienced through service or otherwise shall be reported promptly, and it is intended that courtesy and attention shall be accorded at all times.

P. S. CARMICHAEL, principal of the Hyatt Park School, accompanied his physics class to the Columbia, S. C., gas plant, where they were shown around and the process of gas manufacture was explained to them by S. W. Brown, manager of the plant. This is the second of a series of trips made by the class, which is acquiring a great deal of practical information by these visits to industrial plants.

RESULTS attained by the Tacoma (Wash.) Gas Company Educational Club in its study of the gas course of the National Commercial Gas Association have been so gratifying that the Tacoma School Board has agreed to furnish a teacher one night each week for the class. Meetings will be held at one of the high schools where access may be had to laboratories for testing and experimental work.

IN order to provide gas for Morgan Park, the Minnesota Steel Company's model city, the city of Duluth will extend its mains to the boundary of the company's private land and permit it to use the extension in consideration of the payment of interest on the investment. Proposals of the Minnesota Steel Company and the Zenith Furnace Company, whereby the city would use the steel company's mains and connections already installed at Morgan Park and furnish gas to consumers at the same rate as is charged in Duluth, were rejected by the commissioners because of unsatisfactory provisions. A proposed contract was submitted by each of the companies.

RESULTS of efforts to increase the gas heating load by the San Diego (Cal.) Consolidated Gas and Electric Company are shown in the new business taken. During the week ending October 15, the department secured contracts for 288 installations, including 23 gas radiators, 30 floor furnaces, 6 gas grates, 1 room heater, 1 hotel range and bake oven, 1 brazing forge, 2 vulcanizing furnaces and 1 large water vat heater.

THE Dundee Township, Ills., Highway Commissioners have issued a permit to the Western United Gas and Electric Company for the laying of gas mains into the village of East Dundee.

WRIGHTSVILLE BEACH and the intervening points between there and Wilmington, N. C., along the suburban line of the Tidewater Power Company, are to have gas service by early spring of next year. The Tidewater Power Company already has gas service as far as Carolina Place and Carolina Heights, and is now putting in a line to Carolina Court, in the eastern section of the city. The new line, however, will not be an extension of these mains, but will start at the gas plant on Castle street, and run to the beach. The new line will be high pressure, because of the 10 miles to be covered. The only additional equipment to be installed at the plant will be compressors, the facilities for producing being already provided. The suburban points that will be served in addition to Wrightsville Beach, include Audubon, Winter Park Gardens, Winter Park, Delgado, Seagate, Wrightsville and the new surburb, Oleander.

CONNECTING with the main transmitter at Canal and Carrollton avenue, New Orleans, the gas company is constructing a 12-inch line in Canal boulevard, through Homedale Park and Lakeview, to West End, Lake Shore Park and the Lake Front. So great is the demand for gas fuel in the lake section that nothing smaller than a 12-inch main was considered sufficient to handle the increasing demands of this rapidly growing area.

THE business at the plant of the Western Gas Construction Company, Fort Wayne, Ind., is on the increase, as is shown by the fact that 55 men have been employed in the last month. About 30 of the number are at work in the boiler shop, and the remainder are employed in the foundary or in the construction of the new addition to that building.

UTILITIES COMMISSION NEWS.

UNREASONABLE REGULATIONS REGARDING SIDINGS.—The Public Service Commission, Second District, New York, has ordered the New York Central Railroad to reconstruct a sidetrack and structure over the coal pit of the Dundee Electric Lighting Plant, of which Mrs. Evelyn H. Bailey is the sole owner, in the village of Dundee, Yates County. The railroad discontinued the sidetrack when the trestle over the coal pit was reported unsafe, and refused to renew it except under an agreement to which the lighting plant management objected because it made it responsible for all detriment, damage, costs, suits or expenses which the railroad might suffer because of the track, because of the $5 annual rental the railroad proposed to charge, and because the railroad company purported to reserve the privilege of cancelling the contract and removing the track on 30 days' notice.

The railroad has now offered a new contract in which the indemnity clause is replaced by one in consonance with a recent decision of the Commission in a similar case. The Commission rules that the $5 annual rental is reasonable inasmuch as it is a nominal charge, and the structure is wholly on the railroad's right of way. It refuses, however, to authorize the clause providing for the termination of the contract on 30 days' notice, on the ground that as the Commission has power to order the installation of a sidetrack or its continuance, the railroad cannot arbitrarily discontinue one. The Commission permits a clause allowing discontinuance, "in accordance with law" on 30 days' notice.

URGES LIBERAL TREATMENT.—In approving an allowance of 12% of the physical valuation of the Bronx Gas and Electric Company as the proper capital charge for preliminary and development expenses, Robert C. Wood, of the First District New York Public Service Commission, said:

"The Bronx Gas and Electric Company was incorporated in 1893, and commenced business in 1895. The electrical industry was then in its infancy. The gas business had not advanced to its present state of development, and was then in a comparatively crude state as compared with that of the present day. The company's franchise rights and field of operations covered a sparcely settled territory, which extended over a large area, the so-called Annex District in the Bronx. In short, it was a period when investors in public utility corporations expected a larger return upon their investment than they can get to-day. The company had then, as now, the question before it of its ability to market its bonds and so raise funds to meet the requirements of the territory it served.

"I believe that public utility companies, especially those beginning business in new territory, are entitled to a legitimate sum for certain expenses that must be met before the plant can commence operation.

"I believe that individuals or corporations that are willing to invest their funds in development enterprises, or in the securities of public utility companies that assist in opening up or serving new territory, deserve fair and liberal treatment and, further, that the investment of funds and expenditures such as these should be encouraged by those in authority, as far as is consistent and proper.

"Every public utility corporation, be it gas, electricity, light or street railway, aids the development of the territory it serves, particularly new and sparsely settled sections, provided it furnishes proper and adequate facilities.

"During the construction period of utilities, many and varied expenses have to be met, contractors must be allowed a fair profit, or, if the work is done by the company itself, proper supervision must be provided. Engineers must be employed to supervise the construction and installation of plant and equipment, and a sum must be set aside to meet unforseen contingencies which are bound to occur in every undertaking of this character. In appraising the plant and equipment of a public utility company a fair allowance should be made for all these items."

UNIFORM RULES FOR COAST CITIES.—Los Angeles' service regulations affecting public utility companies furnishing gas and electricity, prepared by the City Board of Public Utilities, have been held up indefinately. It had been proposed to adopt them immediately, but the board received word that the State Railroad Commission has deferred action until a new set of regulations is compiled to agree with the regulations of the other Coast States. When the Railroad Commission adopts regulations applying to all the territory under its jurisdiction, Los Angeles will join with the other Coast cities of California, Washington and Oregon, and adopt uniform regulations for the utilities within their limits.

Financial Notes.

PACIFIC GAS AND ELECTRIC shows a surplus of $3,876,340 for the 12 months ended Sept. 30, which compares with $2,304,273 for the previous 12 months. Net earnings were $7,765,147, as against $6,622,302 last year. For the 9 months ended Sept. 30, 1915, net earnings were $5,894,599, as against $5,127,483 the preceeding year. Surplus was $3,034,003, which compares with $1,862,578 in 1914. A comparative income account for 12 months follows:

	1915.	1914.
Gross operating revenue—		
Electric department	$9,614,172	$8,631,701
Gas department	7,444,807	6,971,586
Other departments	1,077,168	1,142,015
Total	18,136,147	16,745,302
Expenses—		
Maintenance and general	8,083,635	8,082,062
Taxes	812,365	735,573
Reserve for casulaties and uncol. accts	225,000	189,750
Reserve for depreciation	1,240,000	1,115,615
Total	10,361,000	10,123,000
Net earnings from operation	7,765,147	6,623,302
Add profits on merchandise sales and other miscellaneous income	351,224	321,603
Total net income	8,116,371	6,943,905
Bond interest	3,928,783	3,934,562
Balance	4,187,587	3,009,343
Interest on 1-year notes and floating debt (temporary)	69,897	259,038
Balance	4.117,690	2,750,304
Apportionment bond discount and exp..	120,180	147,670
Apportionment note discount and expense (temporary)	121,169	298,399
Total discount and expenses	241,348	446,040
Surplus	3,876,340	2,304,263
Dividends—		
First preferred	290,627	.....
Original preferred	600,000	600,000
Total.	890,627	600,000
Surplus unappropriated	2,985,712	1,704,263

THE success attending the first offer of common shares of the CONSOLIDATED GAS, ELECTRIC LIGHT & POWER CO. (Balto., Md.) to its consumers on easy terms has resulted in the plan of mutualizing the interests of the consumer and the company becoming a permanent feature. During the first month the offer was made consumers subscribed to 3091 shares, paying for it at the rate of $4 a month with their gas and electric bills. At this rate the stock will be paid for in slightly over two years. Interests on the deposits is allowed at 6% per annum, compounded quarterly. Since then the subscriptions to additional shares have been received systematically, and each month has seen a wider local distribution of the stock. Holders of common stock of record on Sept. 15 last numbered 2009, and their holdings aggregated 114,723 shares. The average number of common shares per stockholder is 57. There has been a large increase in the number of women shareholders. On Sept. 15 there were 672 women holding 12,718 shares. In 1906 the total number of shareholders was 613. In 1915 the total number is 2,544, an increase of 1,931 shareholders, or 315%. As originally announced by Mr. Aldred, the plan of offering stock to consumers on easy terms was to provide a means of saving and investment, making the stock available to consumers at or about the prevailing market price, and payable in small monthly installments. The price until November 10 is $107.50 a share, or 50 cents a share under the prevailing market quotation.

THE CONSOLIDATED GAS COMPANY (N. Y.) Directors did what most people of the financial district thought they would do in ordering a quarterly dividend payment no greater than the last one. There were, however, numerous speculators in Consolidated Gas shares who met with disappointment. This was reflected in a net recession of 3½% in the quotation. In one respect the dividend action was different from that at the two previous quarterly meetings in that the disbursement of 1¾% was made the "regular" dividend. At the previous declarations there was a regular dividend of 1½%, and an extra of ¼ of 1%. The extras were understood to be on account of income stockholders did not receive in the period when 4%, instead of 6%, was paid yearly. The current dividend will be paid Dec. 15 to shareholders of record Nov. 11.

THE directors of the OHIO CITIES GAS COMPANY have ordered the common stock placed on a 6% per annum basis, with the December quarter. Heretofore the company has paid 5%. Increased earnings, together with successful oil and gas wells, in addition to higher prices for crude oil, have placed the company in a favorable financial condition.

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